Industry view: VoLTE poses new test challenges

Kristin Lewotsky - September 28, 2012

There was a time mobile service was all about talk, with service providers running commercials touting the quality of their voice transmission. With the advent of smart phones and mobile Internet, that began to change. In today’s mobile networks, data is king and voice has become almost an afterthought. Small wonder, then, that the long-term evolution (LTE) standard defines a packet-based data network. Instead of supporting data on a voice network, service providers will now be delivering voice over a packet-based network in a service dubbed voice over LTE (VoLTE).

I say will, because currently there are few actual 4G networks in operation, despite the sales of 4G handsets. During the transition, LTE voice calls on a 4G network are actually carried by the 3G network. More important, if the user accessing data receives an LTE call, both call and data access move onto the 3G network in a process known as circuit-switched fallback (CSFB). This compromises the quality of service received by the user. Perhaps more important, it imposes an added burden on the network. Operators can get a better understanding of the process and ways to optimize their network with proper test and monitoring techniques.

We talked with Kethees Ketheesan, VP Systems Engineering at Newfield Wireless (Berkeley, CA) to find out more about the ways VoLTE impacts LTE networks, and the tools available to mitigate these issues.

Kristin Lewotsky: What is the biggest challenge network designers are up against?
Kethees Ketheesan: LTE is brand-new even to do the basic data services in an optimized way it is still not been fully perfected yet number two we're trying to do a quality of service and to end on a radio access network which itself is brand-new so it's kind of a double whammy challenged to operators to achieve this end goal of launching VoLTE in an aggressive timeline.

K.L.: What are the biggest headaches for VoLTE engineers?
K.K.: The center of the universe for VoLTE working very well is the eNodeB scheduler. As an engineer trying to make sure whether VoLTE is working as it's intended to, how do you troubleshoot how you characterize the performance of the eNodeB scheduler? Well, first you need to know how the service is functioning—how the IMS is setting it up. Number two is how would the intermediate protocols of the channelizing and setting up the bearers. Number three is how eNodeB is channelizing over the radio interface. Lastly, what is the effective QoS experienced by the user over the radio interface?

K.L.: What is the most common misconception when it comes to testing and monitoring VoLTE networks?
K.K.: One is the need to do a complete end to end aspect. That is the fundamental paradigm shift coming into LTE—it’s based on data bearers as opposed to a 3G model where you have dedicated
voice bearers end to end and have a separate set of data bearers. That makes it very different and people tend to not appreciate the need for it until a little too late.

Landline voice over IP took quite a while to mature into a commercially viable scalable solution. Even there, as we all know, the way it is currently solved is by throwing bandwidth at it. Yes, there is cost involved but there is no physics that limit you whereas in wireless it’s the laws of physics: The spectrum is limited and costly and by definition a radio interface is very unpredictable. It has a highly variable nature where anything you want to do—finite deterministic quality-of-service-based services, or services on an unpredictable and constrained channel—is challenging to begin with and then you don't have the luxury of voice over IP landline guys did of throwing bandwidth at it and so you have this highly constrained problem to solve.

The number two mistake is the underlying design to scale with the volume. The scalability points and chokepoints 2G and 3G do not carry over into 4G—4G breakpoints and chokepoints are fairly different and its scalability is challenge is quite different so we need a fresh start.

K.L.: What are those chokepoints?
KK: The need to have a continuous monitoring of all the different key data points: the radio interface EPC, SKP, the policy engine and possibly the IMS itself—the ability to the ability to look at the spectral constrainment in conjunction with the policy side of the system. In order do that correlation you need a massively scalable big data engine.

When you do a voice call, it primarily has to deal with signaling up front and it’s generally quiet unless you are highly mobile and but that mobility is less than 20% of uses—most uses are indoors and stationary, relatively speaking whereas in a data centric call you can be stationary but have lots of stuff happening on your smartphone. The signaling load is an order of magnitude greater. That’s the second chokepoint that everyone overlooks.

K.L.: You have a tool for VoLTE network visualization and optimization. Can you talk more about it?
K.K.: TrueCall gives [network engineers] complete visibility into what's happening all the way from the radio interface to the eNodeBs to the MMEs and all the way into the core network and IMS, and we correlate all of these events end to end. We instrument all of the key chokepoints—we get data feed from eNodeBs, from the MMEs, and from the EPC and IMS node. In 2013, we will be getting also data feed from the probes on some of the key interfaces as well.

K.L.: That’s an enormous volume of information— it sounds like a Big Data problem which can be computationally intensive. How do you handle it?
K.K.: We have a massive multistage correlation engine sitting inside the operator network where all these feeds and data sources come in in real-time. We present the complete correlative set of results and if a particular voice call or VoLTE call is experiencing a particular type of problem, then one of the four data points coming in will exceed a threshold or KPI [key performance indicator]. The system will automatically alert the operator as to the root cause of the problem and immediately help them troubleshoot it even before anybody complains about it.

K.L.: How does CSFB affect testing requirements?
K.K.: If you're an Apple iPhone engineer, you have to test how the iPhone5 is going to fall back to 3G and verify that it’s going to come back to LTE gracefully. We have an ability to track the device regardless of the access technology used over the radio interface. You can start from LTE, you will see that it will come in as LTE TrueCall. It can fall back to 3G and you will see it falling back to 3G in the UMTS of TrueCall and then you can see that coming back to LTE. We can show the success rate,
the failure rate, and exactly where it is failing in the back-and-forth between the two technologies. You can also pick up at that messages exchanged between the device and the network at the point of failure and this is something you can do just sitting at a desktop.

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